WARE MALCOMB

ARCHITECTURE | PLANNING | INTERIORS
BRANDING | CIVIL ENGINEERING

May 24, 2023

9500 Civic Center Drive
Thornton, CO 80229
Attn: Grant Bloom

Re: Drainage Letter – Anythink Nature Library COT Infrastructure Phase

To: Grant Bloom,

This letter is written to address the effect that the proposed Anythink Nature Library infrastructure phase development will have on existing drainage patterns. The Anythink Nature Library site is located within a parcel of land in the southeast quarter section 20, township 1 south, range 67 west of the sixth principal meridian, City of Thornton, County of Adams, State of Colorado with an infrastructure phase site area of 3.31 acres. The current conditions of the site are undeveloped with native grasses. The scope of the infrastructure phase consists of an access drive, lane widening on 136th Ave, and utilities. Refer to exhibit in appendix.

The historic drainage patterns surrounding the access drive are generally sloping from the northwest to the southeast at an average slope of 8%. In the existing state of the site, all flows are directed overland to an existing Aylor Retention II Pond on the eastern side of the site. The infrastructure phase of the project includes a temporary sediment basin that is designed to capture and release water into the existing slope towards mentioned retention pond. See the appendix for associated sediment basin calculations.

This study has been prepared in conformance with the City of Thornton Standards and Specifications for the Design and Construction of Public and Private Improvements criteria manual and the Mile High Flood District Storm Drainage Criteria Manual.

The minor and major storm frequencies for design are the 5-year and 100-year storm events, respectively. The one-hour point rainfall for the 5-year event is 1.38 inches and 2.69 inches for the 100-year event in accordance with the City or Thornton Standards and Specifications for the Design and Construction of Public and Private Improvements criteria manual. The peak discharge for the storm sewer analysis was calculated using the rational method. Please reference the Drainage Map in the appendix for the basin location and calculations of the rational method and total flows at respective design points.

StormCAD was used to analyze the capacity and routing of the proposed storm sewer. StormCAD uses Manning's equation to conclude if pipe sizing is adequate to prevent unintentional pooling at grade anywhere in the system. Grate capacity charts and UD-Inlet were used to determine if the proposed inlets were adequate to handle 100-year storm levels.

The proposed design is in accordance with Mile High Flood District and City of Thornton design standards and will not affect historic drainage patterns.

Should you have any questions or comments, please feel free to contact me at (303) 561-3333.

Sincerely,

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Ware Malcomb,

Ted Swan, PE
Director of Civil Engineering

CC: Ileana Contreras icontreras@waremalcomb.com (303) 689-1518

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Appendix

City of Thornton Storm Drainage Design Criteria – Table 400-1
Hydrology Calculations
Hydraulic Calculations
Temporary Sediment Basin Calculations
Drainage Map

Appendix

SECTION 400 - STORM DRAINAGE DESIGN, GRADING, AND WATER QUALITY TECHNICAL CRITERIA

401 GENERAL PROVISIONS

401.1 Purpose

A. These standards are promulgated by the Public Works Director of the City in accordance with the authority contained in the City Code. Improvements shall also be in conformance with all applicable provisions of the City Code. B. This section presents the minimum design and technical criteria for the analysis and design of storm drainage facilities located within the City. All subdivisions or any other proposed construction, which increase drainage from historic levels or otherwise alters storm runoff shall be subject to these Standards and Specifications. The primary resource for stormwater drainage policy and design is the Urban Drainage and Flood Control District's (UDFCD) Urban Storm Drainage Criteria Manual (UDFCD Manual). The purpose of these Standards and Specifications is to further define the guidelines and/or to identify variations.

C. In addition to the above, these regulations are to establish minimum design criteria for water quality control, flood control, and site grading, which are all closely related to stormwater management.

1. Design Criteria

Storm drainage system analysis and design shall meet or exceed these Standards and Specifications which were developed to support and supplement the policies and standards set forth by the UDFCD. Policies and technical criteria not specifically addressed in this document shall follow the provisions of the UDFCD Manual. The Responsible Party is also referred to the Colorado Department of Transportation's Standard Plans ("M-Standards") for additional design details not covered in these Standards and Specifications or the UDFCD Manual.

2. Review and Approval

a. The Development Engineering Manager shall review submittals as necessary for general compliance with these Standards and Specifications. An approval by the Development Engineering Manager does not relieve the Responsible Party from the responsibility of ensuring that the calculations, plans, specifications, construction, and record drawings are in compliance with these Standards and Specifications.

b. The UDFCD shall approve reports and construction plans for regional detention ponds or Masterplan drainageway improvements as required by this Section or the UDFCD Manual. Where floodplain delineation is involved, UDFCD and FEMA approval is required. All submittals to either UDFCD or FEMA shall be made to the City, who will coordinate the submittal and approval.

402 STORM DRAINAGE DESIGN CRITERIA

402.1 Rainfall

1. Introduction

A. Colorado Urban Hydrograph Procedure (CUHP) or an equivalent method shall be used to generate an inflow hydrographs from watersheds unless a variance is approved by the Development Engineering Manager.

B. Design Storm Distribution

The one (1) hour design point rainfall values obtained from the NOAA Atlas for Thornton are as follows:

TABLE 400-1

ONE (1) HOUR POINT RAINFALL (IN.)

2-YEAR	5-YEAR	100-YEAR
.97	1.38	2.69

402.2 Runoff

A. Introduction

This subsection presents the criteria and methodology for approximating the storm runoff design peaks and volumes to be used in the City in the preparation of storm drainage studies, plans, and facility design.

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PROJECT: The Library
JOB NO.: DCS22-4022
CALC. BY: SRV
DATE: 5/10/2023

= FORMULA CELLS
= USER INPUT CELLS

Project Location
Thornton - Civic Center

IDF Rainfall Data

	P_1: 1-hour Rainfall Depths (inches)	
	Minor Storm	**Major Storm**
T_d	5-Year	100-Year
Minutes	**1.38**	**2.69**
5	4.68	9.12
10	3.73	7.28
20	2.71	5.29
30	2.17	4.22
40	1.82	3.54
50	1.57	3.07
60	1.39	2.72
120	0.86	1.67

Equation 5-1 $I=(28.5*P_1)/(10+T_d)^{0.786}$

I = rainfall intensity (inches per hour)

P_1 = 1-hour point rainfall depth (inches)

T_d = storm duration (minutes)

Reference:

1) Urban Drainage and Flood Control District - Urban Storm Drainage Criteria Manual Volume 1, 2017
2) NOAA Atlas 14, Volume 8, Version 2
http://hdsc.nws.noaa.gov/hdsc/pfds/pfds_map_cont.html?bkmrk=co

PROJECT:	The Library
JOB NO.:	DCS22-4022
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DATE:	5/10/2023

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Impervious Percentages - from Urban Drainage Table 6-3

Land Use 1	95%	Land Use 5	0%
Land Use 2	2%	Land Use 6	0%
Land Use 3	0%	Land Use 7	0%
Land Use 4	0%	Land Use 8	0%

SOIL TYPE: C or D (use equation from Table 6-4)

= FORMULA CELLS
= USER INPUT CELLS

PROPOSED COMPOSITE IMPERVIOUSNESS

		Weighted Impervious and C Values					Areas (ac)							
Basin	**Area (ac)**	**Imp.**	**C_2**	**C_5**	**C_{10}**	**C_{100}**	**Land Use 1**	**Land Use 2**	**Land Use 3**	**Land Use 4**	**Land Use 5**	**Land Use 6**	**Land Use 7**	**Land Use 8**
A1	5.40	26%	0.18	0.25	0.32	0.59	1.38	4.02						
A2	8.28	2%	0.01	0.05	0.15	0.49		8.28						
A3	2.02	25%	0.18	0.24	0.32	0.59	0.50	1.51						
A4	0.65	95%	0.78	0.81	0.84	0.87	0.65							
B	8.07	50%	0.38	0.44	0.50	0.69	4.15	3.92						

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Calculated By: SRV
Date: 5/10/2023

STANDARD FORM SF-2

TIME OF CONCENTRATION SUMMARY

Project: The Library
Job No.: DCS22-4022
Checked By: ICA

SUB-BASIN DATA				INITIAL/OVERLAND TIME (t_i)			TRAVEL TIME (t_t)					t_c CHECK (URBANIZED BASINS)				FINAL t_c	REMARKS
Basin (1)	i (2)	C_5 (3)	AREA Ac (4)	LENGTH Ft (5)	SLOPE % (6)	t_i Min (7)	LENGTH Ft (8)	Cv	SLOPE % (9)	VEL. FPS (10)	t_t Min (11)	COMP. t_c (12)	L_t Ft (13)	S_t % (14)	tc (Equation 6-5) Min (15)	Min (16)	
A1	0.26	0.25	5.40	500	3.5	22.80	892	20	1.5	2.45	6.07	28.9	892	1.50	31.2	28.87	
A2	0.02	0.05	8.28	500	3.3	28.55	100	7	2.9	1.19	1.40	29.9	100	2.90	26.7	26.71	
A3	0.25	0.24	2.02	285	3.2	17.82	458	20	2.2	2.97	2.57	20.4	458	2.20	25.8	20.39	
A4	0.95	0.81	0.65	10	3.9	1.04	798	20	2.3	3.03	4.38	5.4	798	2.30	13.8	5.43	
B	0.50	0.44	8.07	500	3.9	16.91	580	20	2.5	3.16	3.06	20.0	580	2.50	21.4	19.97	

Equation 6-3 $t_i=((0.395(1.1-C_5)SQRT(L))/(S_o\text{^}0.33))$

Equation 6-5 $t_c=(26-17i)+(L_t/(60(14i+9)SQRT(S_o)))$

= FORMULA CELLS

= USER INPUT CELLS

NRCS Conveyance Factor K Table - Cv Value	
Heavy Meadow	2.5
Tillage/Field	5
Short Pasture and Lawns	7
Nearly Bare Ground	10
Grassed Waterway	15
Paved Areas and Shallow Paved Swales	20

Calculated By: SRV
Date: 5/10/2023
Checked By: ICA
5-Year 1-hour rainfall= 1.38

STANDARD FORM SF-3

STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE)

Project: The Library
Job No.: DCS22-4022
Design Storm: 5-Year

= FORMULA CELLS
= USER INPUT CELLS

	DIRECT RUNOFF								TOTAL RUNOFF				STREET		PIPE						
BASIN	DESIGN POINT	AREA DESIGN	AREA (AC)	RUNOFF COEFF	t_c (MIN)	C * A (AC)	I (IN/HR)	Q (CFS)	t_c (MIN)	S (C * A) (CA)	I (IN/HR)	Q (CFS)	SLOPE (%)	STREET FLOW	DESIGN FLOW (CFS)	SLOPE (%)	PIPE DIAM. (IN.)	LENGTH (FT)	VELOCITY (FPS)	t_t (MIN)	REMARKS
	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
A1	1		5.40	0.25	28.9	1.33	2.21	**2.9**													A1 local flows to DP1
A2	2		8.28	0.05	26.7	0.43	2.32	**1.0**	28.9	1.8	2.21	**3.9**									A1 & A2 combined flow at DP2
A3	3		2.02	0.24	20.4	0.49	2.69	**1.3**	28.9	2.2	2.21	**5.0**									A1, A2 & A3 combined flow at DP3
A4	4		0.65	0.81	5.4	0.53	4.58	**2.4**													A1 thru A4 combined flow at DP4
B	5		8.07	0.44	20.0	3.58	2.72	**9.7**													Local flow at DP5
	6								28.9	6.3	2.21	**14.1**									Total flow from site at DP6

Calculated By: SRV
Date: 5/10/2023
Checked By: xxxxxxxxxx
100-Year 1-hour rainfall= 2.69

STANDARD FORM SF-3

STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE)

Project: The Library
Job No.: DCS22-4022
Design Storm: 100-Year

= FORMULA CELLS
= USER INPUT CELLS

	DIRECT RUNOFF								TOTAL RUNOFF				STREET		PIPE						
BASIN	DESIGN POINT	AREA DESIGN	AREA (AC)	RUNOFF COEFF	t_c (MIN)	C * A (AC)	I (IN/HR)	Q (CFS)	t_c (MIN)	S (C * A) (CA)	I (IN/HR)	Q (CFS)	SLOPE (%)	STREET FLOW	DESIGN FLOW (CFS)	SLOPE (%)	PIPE DIAM. (IN.)	LENGTH (FT)	VELOCITY (FPS)	t_t (MIN)	REMARKS
	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
A1	1		5.40	0.59	28.9	3.19	4.32	**13.8**													A1 local flows to DP1
A2	2		8.28	0.49	26.7	4.08	4.51	**18.4**	28.9	7.3	4.32	**31.4**									A1 & A2 combined flow at DP2
A3	3		2.02	0.59	20.4	1.19	5.24	**6.2**	28.9	8.4	4.32	**36.5**									A1, A2 & A3 combined flow at DP3
A4	4		0.65	0.87	5.4	0.56	8.92	**5.0**													A1 thru A4 combined flow at DP4
B	5		8.07	0.69	20.0	5.56	5.30	**29.4**													Local flow at DP5
	6								28.9	14.6	4.32	**62.9**									Total flow from site at DP6

PROJECT: The Library
JOB NO.: DCS22-4022
CALC. BY: SRV
DATE: 5/10/2023

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RUNOFF SUMMARY

BASIN LABEL	DESIGN POINT	AREA	LOCAL (CFS)		ACCUMULATIVE (CFS)	
			Q5	Q100	Q5	Q100
A1	1	5.40	2.95	13.76		
A2	2	8.28	1.0	18.4	3.9	31.4
A3	3	2.02	1.3	6.2	5.0	36.5
A4	4	0.65	2.4	5.0		
B	5	8.07	9.7	29.4		
					14.1	62.9

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PROJECT : Anythink Library
PROJECT NO. : DEN22-0022

DATE : 5/19/2023
BY : ICA

Sediment Basin

Required Sediment Pond

Tributary Area (ac)	Disturbed Area (ac)	Undisturbed Area (ac)
28.00	**2.74**	**25.26**

1/3 Volume =	**0.172**	**ac-ft**	
1/3 V =	7,498	cu-ft	
Volume Req =	**0.516**	**ac-ft**	*3600 CF / disturbed Ac + 500 CF / undisturbed AC*
V =	22,494	cu-ft	*(Per MHFD Standard for Tributary area)*
1.25' Above Bottom V=	**0.287**	**ac-ft**	*(Use this value because it's greater the 1/3V)*
1.25' V=	12,505	cu-ft	
Total Volume Req'd =	**0.689**	**ac-ft**	
Total Volume Req'd =	29,992	cu-ft	

Note: Invert of lowest orfice shall be at the elevation cooresponding to 1/3 V or 1.25' whichever is greater

Provided Volume

Contour Elevation	Ft^2	$1/3\ (A1 + A2 + (A1A2)^{1/2})\ D$	Total Volume (ft^3)	Total Volume (ac-ft)
5187.00	8,799		0	0.00
5188.00	10,729	9,748	9,748	0.22
5188.25	11,327	2,757	12,505	0.29
5189.00	13,141	11,915	21,663	0.50
5190.00	15,539	14,323	35,986	0.83
5191.00	18,429	31,421	53,084	1.22
5192.00	21,468	36,848	72,834	1.67

	WSEL	Depth (ft)
1/3 VOL =	5187.77	0.77
1.25' ABOVE BOTTOM VOL =	5188.25	1.25
TOTAL VOL=	5189.58	2.58

Invert of bottom Outlet Hole to be 1.25' (El: 5188.25')

Riser Pipe Orifice Sizing

(from UDFCD Memo: *Water Quality orifice sizing equation for EURV and WQCV detetion basins*, dated July 13, 2010)

$$A_O = \frac{88Vol^{(0.95/H^{0.085})}}{T_D S^{0.09} H^{2.6(S^{0.3})}}$$ *Equation 9*

Where:

- A_O is the required orifice area per row in square inches,
- S is slope in feet vertical / feet horizontal (substitute 0.0001 for zero),
- Vol is the storage volume in acre-feet,
- T_D is the prescribed drain time in hours, and
- H is the storage depth at the outlet above the lowest orifice, in feet.

Area Per Row:	3.08	Sq. In.	H=	2.75	*Ft*
Diameter:	0.40	In.	S=	0.0001	*(flat bottom approximation)*

Note: drainage time is set to 40 hrs

Scenario: 5-YEAR
Current Time Step: 0.000 h
FlexTable: Conduit Table

ID	Label	Start Node	Invert (Start) (ft)	Stop Node	Invert (Stop) (ft)	Length (User Defined) (ft)	Slope (Calculated) (ft/ft)	Diameter (in)	Manning's n	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)
122	PIPE - 31	SD-MH-A03	5,193.23	SD-INLET-A02	5,187.56	241.9	0.023	24.0	0.015	5,194.34	5,188.34
123	PIPE - 53	SD-INLET-A02.3	5,188.60	SD-INLET-A02.2	5,188.34	51.5	0.005	24.0	0.015	5,189.23	5,188.95
124	PIPE - 54	SD-INLET-A02.2	5,188.14	SD-INLET-A02.1	5,187.93	41.0	0.005	24.0	0.015	5,188.86	5,188.63
125	PIPE - 34	SD-INLET-A02.1	5,187.73	SD-INLET-A02	5,187.56	34.0	0.005	24.0	0.015	5,188.63	5,188.58
126	PIPE - 30	SD-INLET-A02	5,187.36	SD-FES-A01	5,187.01	72.6	0.005	36.0	0.015	5,188.58	5,188.20

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Scenario: 5-YEAR
Current Time Step: 0.000 h
FlexTable: Manhole Table

ID	Label	Elevation (Ground) (ft)	Elevation (Rim) (ft)	Elevation (Invert in 1) (ft)	Flow (Total Out) (cfs)	Depth (Out) (ft)	Hydraulic Grade Line (Out) (ft)	Notes
101	SD-MH-A03	5,199.94	5,199.94	(N/A)	9.72	1.12	5,194.34	5' MANHOLE
102	SD-INLET-A02.3	5,193.97	5,193.97	(N/A)	3.01	0.63	5,189.23	20' TYPE R INLET
104	SD-INLET-A02.2	5,192.88	5,192.88	5,188.34	3.92	0.72	5,188.86	TYPE C INLET w/ CLOSED MESH GRATE
105	SD-INLET-A02.1	5,192.75	5,192.75	5,187.93	4.98	0.90	5,188.63	20' TYPE R INLET
106	SD-INLET-A02	5,192.53	5,192.53	5,187.56	13.96	1.22	5,188.58	10' TYPE R INLET

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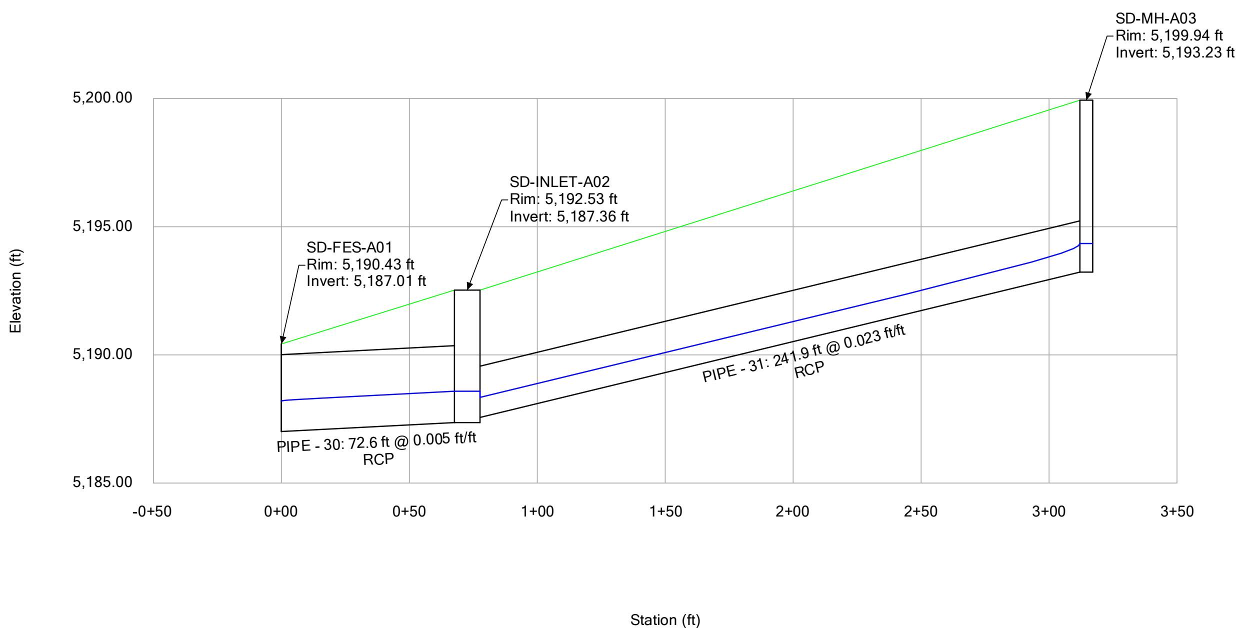
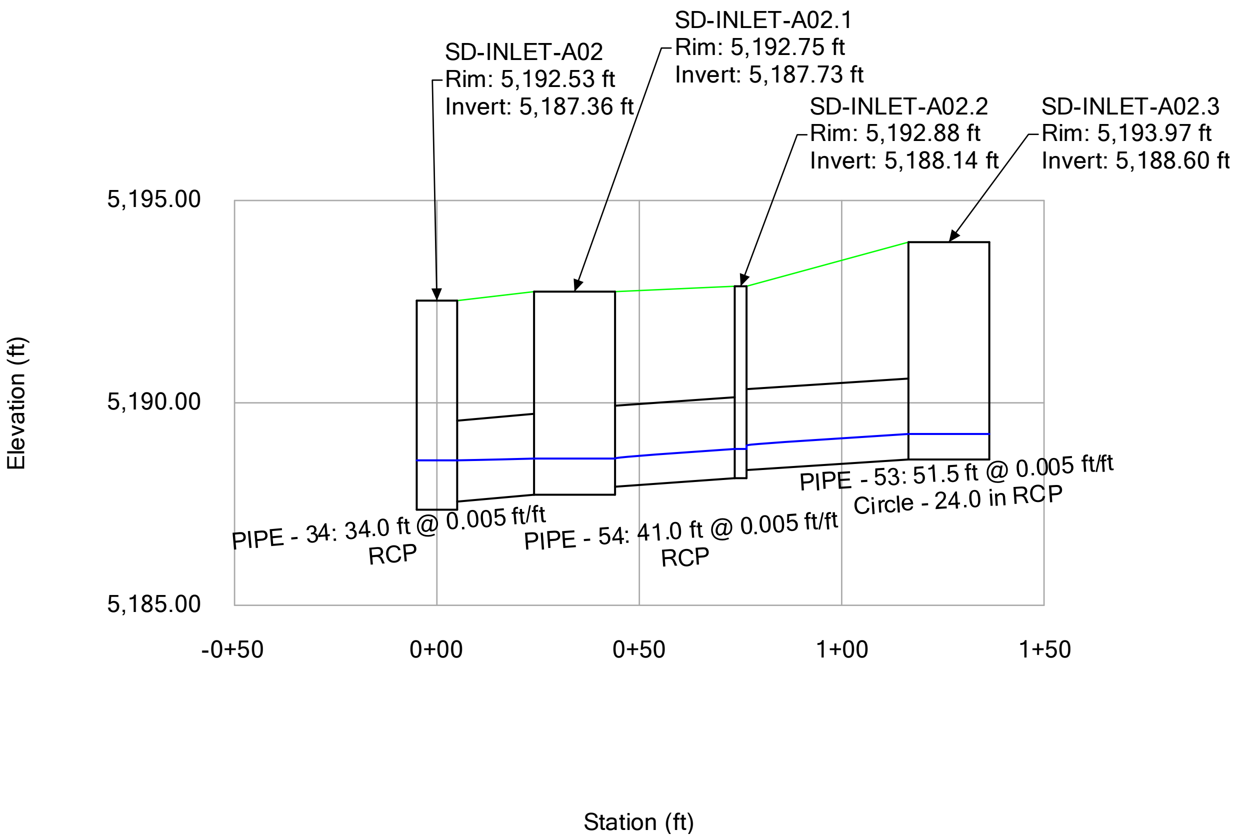
Profile Report
Engineering Profile - A (DCS22-4022_StormCAD.stsw)



Profile Report
Engineering Profile - A2 (DCS22-4022_StormCAD.stsw)



Scenario: 100-YEAR
Current Time Step: 0.000 h
FlexTable: Conduit Table

ID	Label	Start Node	Invert (Start) (ft)	Stop Node	Invert (Stop) (ft)	Length (User Defined) (ft)	Slope (Calculated) (ft/ft)	Diameter (in)	Manning's n	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)
122	PIPE - 31	SD-MH-A03	5,193.23	SD-INLET-A02	5,187.56	241.9	0.023	24.0	0.015	5,196.22	5,190.66
123	PIPE - 53	SD-INLET-A02.3	5,188.60	SD-INLET-A02.2	5,188.34	51.5	0.005	24.0	0.015	5,193.14	5,192.88
124	PIPE - 54	SD-INLET-A02.2	5,188.14	SD-INLET-A02.1	5,187.93	41.0	0.005	24.0	0.015	5,192.89	5,191.83
125	PIPE - 34	SD-INLET-A02.1	5,187.73	SD-INLET-A02	5,187.56	34.0	0.005	24.0	0.015	5,191.83	5,190.66
126	PIPE - 30	SD-INLET-A02	5,187.36	SD-FES-A01	5,187.01	72.6	0.005	36.0	0.015	5,190.66	5,189.56

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Scenario: 100-YEAR
Current Time Step: 0.000 h
FlexTable: Manhole Table

ID	Label	Elevation (Ground) (ft)	Elevation (Rim) (ft)	Elevation (Invert in 1) (ft)	Flow (Total Out) (cfs)	Depth (Out) (ft)	Hydraulic Grade Line (Out) (ft)	Notes
101	SD-MH-A03	5,199.94	5,199.94	(N/A)	29.72	2.99	5,196.22	5' MANHOLE
102	SD-INLET-A02.3	5,193.97	5,193.97	(N/A)	13.86	4.54	5,193.14	20' TYPE R INLET
104	SD-INLET-A02.2	5,192.88	5,192.88	5,188.34	31.39	4.74	5,192.88	TYPE C INLET w/ CLOSED MESH GRATE
105	SD-INLET-A02.1	5,192.75	5,192.75	5,187.93	36.51	4.10	5,191.83	20' TYPE R INLET
106	SD-INLET-A02	5,192.53	5,192.53	5,187.56	63.00	3.30	5,190.66	10' TYPE R INLET

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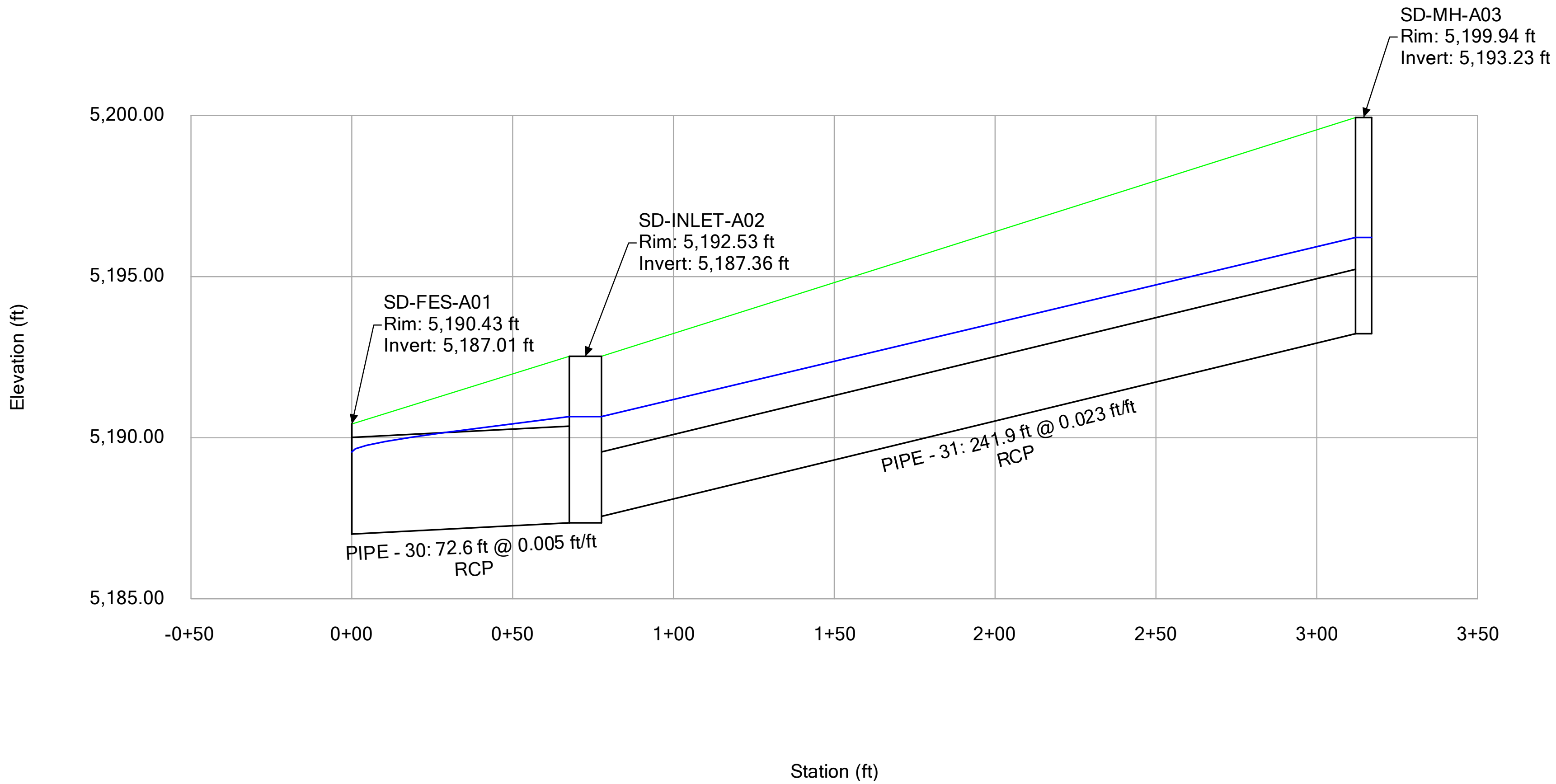
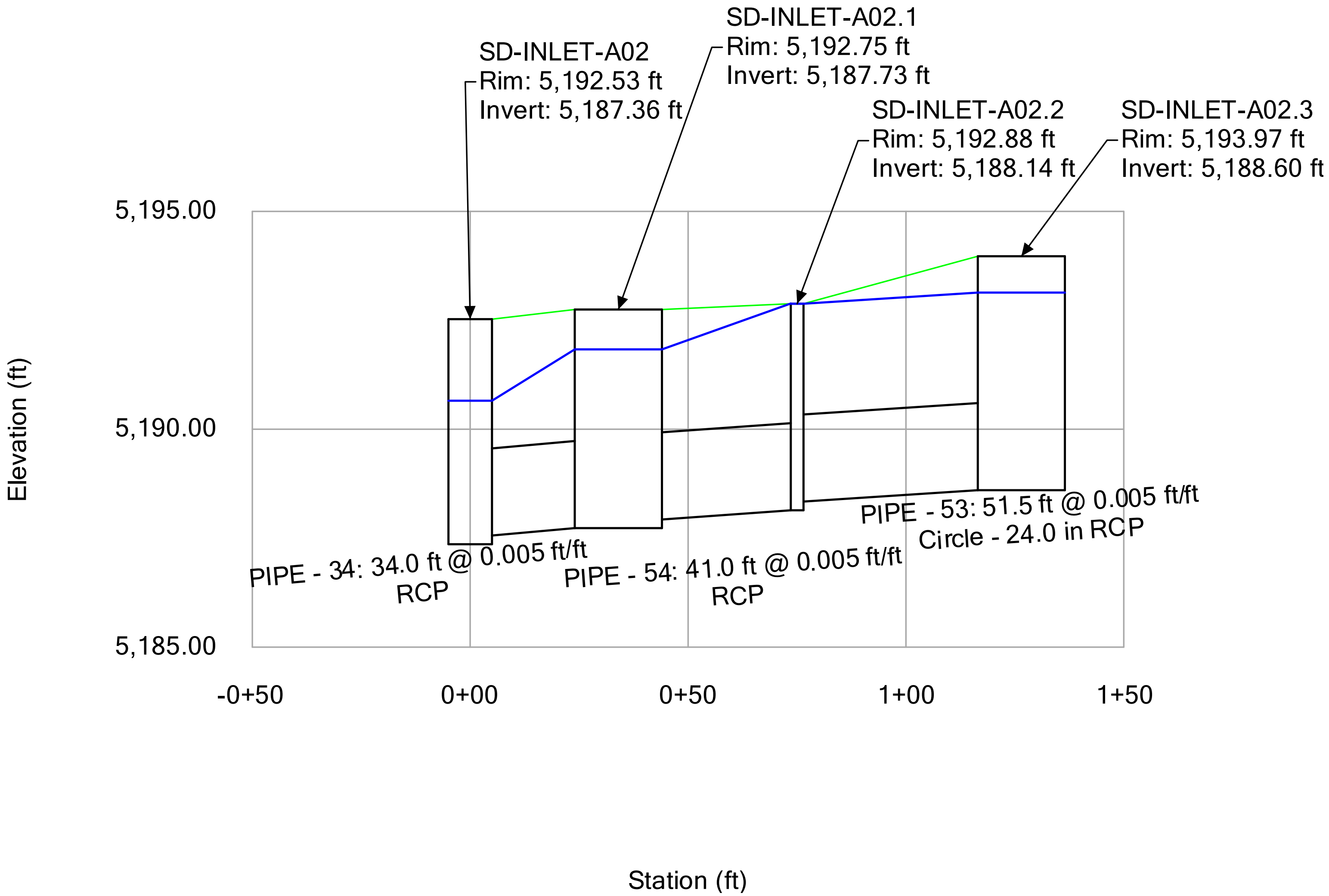
Profile Report
Engineering Profile - A (DCS22-4022_StormCAD.stsw)



Profile Report
Engineering Profile - A2 (DCS22-4022_StormCAD.stsw)



MHFD-Inlet, Version 5.02 (August 2022)

INLET MANAGEMENT

Worksheet Protected

INLET NAME	SD-INLET-A02.3	SD-INLET-A02.1	SD-INLET-A02.2
Site Type (Urban or Rural)	URBAN	URBAN	URBAN
Inlet Application (Street or Area)	STREET	STREET	AREA
Hydraulic Condition	On Grade	In Sump	Swale
Inlet Type	CDOT Type R Curb Opening	CDOT Type R Curb Opening	CDOT Type C (Depressed)

USER-DEFINED INPUT

User-Defined Design Flows

Minor Q_{Known} (cfs)	2.9	1.3	1.0
Major Q_{Known} (cfs)	13.8	6.5	18.1

Bypass (Carry-Over) Flow from Upstream Inlets must be organized from upstream (left) to downstream (right) in order for bypass flows to be linked.

Receive Bypass Flow from:	No Bypass Flow Received	User-Defined	No Bypass Flow Received
Minor Bypass Flow Received, Q_b (cfs)	0.0	0.0	0.0
Major Bypass Flow Received, Q_b (cfs)	0.0	0.7	0.0

Watershed Characteristics

Subcatchment Area (acres)			
Percent Impervious			
NRCS Soil Type			

Watershed Profile

Overland Slope (ft/ft)			
Overland Length (ft)			
Channel Slope (ft/ft)			
Channel Length (ft)			

Minor Storm Rainfall Input

Design Storm Return Period, T_r (years)			
One-Hour Precipitation, P_1 (inches)			

Major Storm Rainfall Input

Design Storm Return Period, T_r (years)			
One-Hour Precipitation, P_1 (inches)			

CALCULATED OUTPUT

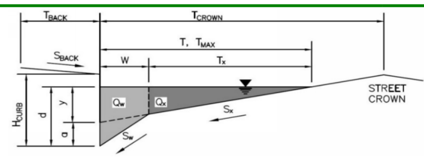
Minor Total Design Peak Flow, Q (cfs)	**2.9**	**1.3**	**1.0**
Major Total Design Peak Flow, Q (cfs)	**13.8**	**7.2**	**18.1**
Minor Flow Bypassed Downstream, Q_b (cfs)	0.0	N/A	0.0
Major Flow Bypassed Downstream, Q_b (cfs)	0.7	N/A	0.0

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Anythink Nature Library - Infrastructure Phase

Inlet ID: SD-INLET-A02.3



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	25.0		ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020		ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.015		
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00		inches
Distance from Curb Face to Street Crown	T_{CROWN} =	30.0		ft
Gutter Width	W =	2.00		ft
Street Transverse Slope	S_X =	0.020		ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083		ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.026		ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.015		
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	30.0	30.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	12.0	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☐	

Maximum Capacity for 1/2 Street based On Allowable Spread

		Minor Storm	Major Storm	
Water Depth without Gutter Depression ($T * S_x * 12$)	y =	7.20	7.20	inches
Vertical Depth between Gutter Lip and Gutter Flowline ($W * S_w * 12$)	d_C =	2.0	2.0	inches
Gutter Depression ($d_C - (W * S_x * 12)$)	a =	1.51	1.51	inches
Water Depth at Gutter Flowline (y + a)	d =	8.71	8.71	inches
Allowable Spread for Discharge outside the Gutter Section (T - W)	T_X =	28.0	28.0	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.194	0.194	
Discharge outside the Gutter Section, carried in Section T_X	Q_X =	63.6	63.6	cfs
Discharge within the Gutter Section ($Q_T - Q_X - Q_{BACK}$)	Q_W =	15.3	15.3	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	5.7	5.7	cfs
Maximum Flow Based On Allowable Spread	**Q_T =**	**84.6**	**84.6**	**cfs**
Flow Velocity within the Gutter Section	V =	11.9	11.9	fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d =	8.6	8.6	

Maximum Capacity for 1/2 Street based on Allowable Depth

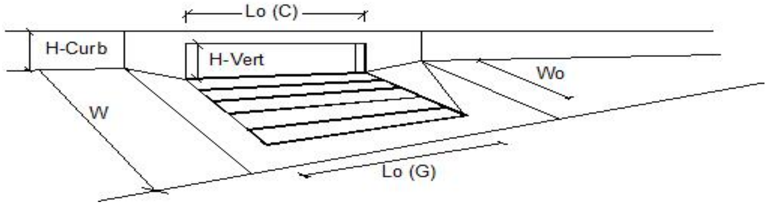
		Minor Storm	Major Storm	
Theoretical Water Spread	T_{TH} =	18.7	43.7	ft
Theoretical Spread for Discharge outside the Gutter Section (T - W)	$T_{X\ TH}$ =	16.7	41.7	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.318	0.130	
Theoretical Discharge outside the Gutter Section, carried in Section $T_{X\ TH}$	$Q_{X\ TH}$ =	16.0	184.1	cfs
Actual Discharge outside the Gutter Section, (limited by distance T_{CROWN})	Q_X =	16.0	174.6	cfs
Discharge within the Gutter Section ($Q_d - Q_X$)	Q_W =	7.5	27.6	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	47.0	cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q =	23.5	249.3	cfs
Average Flow Velocity Within the Gutter Section	V =	9.0	15.1	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	4.5	15.1	
Slope-Based Safety Factor for Minor/Major Storm depth reduction, $d \geq 6''$	R =	0.84	0.68	
Max Flow based on Allowable Depth (Safety Factor Applied)	**Q_d =**	**19.9**	**170.7**	**cfs**
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =	5.71	10.69	inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d_{CROWN} =	0.00	1.98	inches

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion MAJOR STORM Allowable Capacity is based on Spread Criterion	**Q_{allow} =**	**19.9**	**84.6**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 2.90 cfs on sheet 'Inlet Management'
Major storm max. allowable capacity GOOD - greater than the design peak flow of 13.80 cfs on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.02 (August 2022)



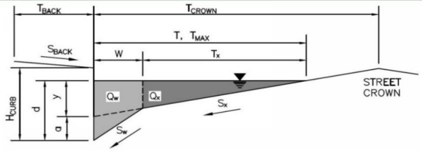
		MINOR	MAJOR	
Design Information (Input) — CDOT Type R Curb Opening		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	4	4	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	5.00	5.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f (G) =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f (C) =	0.10	0.10	
Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Design Discharge for Half of Street (from *Inlet Management*)	Q_o =	2.9	13.8	cfs
Water Spread Width	T =	7.4	15.1	ft
Water Depth at Flowline (outside of local depression)	d =	3.3	5.1	inches
Water Depth at Street Crown (or at T_{MAX})	d_{CROWN} =	0.0	0.0	inches
Ratio of Gutter Flow to Design Flow	E_o =	0.724	0.394	
Discharge outside the Gutter Section W, carried in Section T_x	Q_x =	0.8	8.4	cfs
Discharge within the Gutter Section W	Q_w =	2.1	5.4	cfs
Discharge Behind the Curb Face	Q_{BACK} =	0.0	0.0	cfs
Flow Area within the Gutter Section W	A_W =	0.38	0.69	sq ft
Velocity within the Gutter Section W	V_W =	5.5	7.9	fps
Water Depth for Design Condition	d_{LOCAL} =	6.3	8.1	inches
Grate Analysis (Calculated)		MINOR	MAJOR	
Total Length of Inlet Grate Opening	L =	N/A	N/A	ft
Ratio of Grate Flow to Design Flow	$E_{o\text{-}GRATE}$ =	N/A	N/A	
Under No-Clogging Condition		MINOR	MAJOR	
Minimum Velocity Where Grate Splash-Over Begins	V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R_f =	N/A	N/A	
Interception Rate of Side Flow	R_x =	N/A	N/A	
Interception Capacity	Q_i =	N/A	N/A	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient for Multiple-unit Grate Inlet	GrateCoeff =	N/A	N/A	
Clogging Factor for Multiple-unit Grate Inlet	GrateClog =	N/A	N/A	
Effective (unclogged) Length of Multiple-unit Grate Inlet	L_e =	N/A	N/A	ft
Minimum Velocity Where Grate Splash-Over Begins	V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R_f =	N/A	N/A	
Interception Rate of Side Flow	R_x =	N/A	N/A	
Actual Interception Capacity	**Q_a =**	**N/A**	**N/A**	**cfs**
Carry-Over Flow = Q_o-Q_a (to be applied to curb opening or next d/s inlet)	**Q_b =**	**N/A**	**N/A**	**cfs**
Curb Opening or Slotted Inlet Analysis (Calculated)		MINOR	MAJOR	
Equivalent Slope S_e	S_e =	0.156	0.094	ft/ft
Required Length L_T to Have 100% Interception	L_T =	8.58	23.98	ft
Under No-Clogging Condition		MINOR	MAJOR	
Effective Length of Curb Opening or Slotted Inlet (minimum of L, L_T)	L =	8.58	20.00	ft
Interception Capacity	Q_i =	2.9	13.3	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient	CurbCoeff =	1.33	1.33	
Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet	CurbClog =	0.03	0.03	
Effective (Unclogged) Length	L_e =	8.58	19.34	ft
Actual Interception Capacity	**Q_a =**	**2.9**	**13.1**	**cfs**
Carry-Over Flow = $Q_{b(GRATE)}$-Q_a	**Q_b =**	**0.0**	**0.7**	**cfs**
Summary		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**2.9**	**13.1**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**0.7**	**cfs**
Capture Percentage = Q_a/Q_o	**C% =**	**100**	**95**	**%**

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Anythink Nature Library - Infrastructure Phase

Inlet ID: SD-INLET-A02.1



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	10.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.015	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.015	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	12.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

Maximum Capacity for 1/2 Street based On Allowable Spread

		Minor Storm	Major Storm	
Water Depth without Gutter Depression (T * S_x * 12)	y =	4.08	4.08	inches
Vertical Depth between Gutter Lip and Gutter Flowline (W * S_w * 12)	d_C =	2.0	2.0	inches
Gutter Depression (d_C - (W * S_x * 12))	a =	1.51	1.51	inches
Water Depth at Gutter Flowline (y + a)	d =	5.59	5.59	inches
Allowable Spread for Discharge outside the Gutter Section (T - W)	T_X =	15.0	15.0	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.350	0.350	
Discharge outside the Gutter Section, carried in Section T_X	Q_X =	0.0	0.0	cfs
Discharge within the Gutter Section (Q_T - Q_X - Q_{BACK})	Q_W =	0.0	0.0	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	0.0	cfs
Maximum Flow Based On Allowable Spread	**Q_T =**	**SUMP**	**SUMP**	**cfs**
Flow Velocity within the Gutter Section	V =	0.0	0.0	fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d =	0.0	0.0	

Maximum Capacity for 1/2 Street based on Allowable Depth

		Minor Storm	Major Storm	
Theoretical Water Spread	T_{TH} =	18.7	43.7	ft
Theoretical Spread for Discharge outside the Gutter Section (T - W)	$T_{X\ TH}$ =	16.7	41.7	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.318	0.130	
Theoretical Discharge outside the Gutter Section, carried in Section $T_{X\ TH}$	$Q_{X\ TH}$ =	0.0	0.0	cfs
Actual Discharge outside the Gutter Section, (limited by distance T_{CROWN})	Q_X =	0.0	0.0	cfs
Discharge within the Gutter Section (Q_d - Q_X)	Q_W =	0.0	0.0	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	0.0	cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q =	SUMP	SUMP	cfs
Average Flow Velocity Within the Gutter Section	V =	0.0	0.0	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	0.0	0.0	
Slope-Based Safety Factor for Minor/Major Storm depth reduction, d $\geq$ 6"	R =	SUMP	SUMP	
Max Flow based on Allowable Depth (Safety Factor Applied)	**Q_d =**	**SUMP**	**SUMP**	**cfs**
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =			inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d_{CROWN} =			inches

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is not applicable to Sump Condition MAJOR STORM Allowable Capacity is not applicable to Sump Condition	**Q_{allow} =**	**SUMP**	**SUMP**	**cfs**

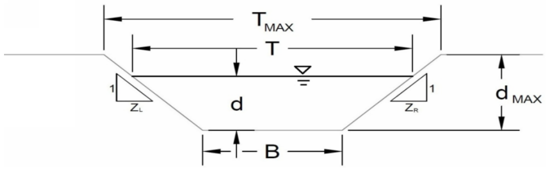
INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.02 (August 2022)

		MINOR	MAJOR	
Design Information (Input)		MINOR	MAJOR	
Type of Inlet — CDOT Type R Curb Opening	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	4	4	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	5.6	5.6	inches
Grate Information		MINOR	MAJOR	Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Open Area Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Grate Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	N/A	N/A	
Clogging Factor for Multiple Units	Clog =	N/A	N/A	
Grate Capacity as a Weir (based on MHFD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	N/A	N/A	cfs
Interception with Clogging	Q_{wa} =	N/A	N/A	cfs
Grate Capacity as an Orifice (based on MHFD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	N/A	N/A	cfs
Interception with Clogging	Q_{oa} =	N/A	N/A	cfs
Grate Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	N/A	N/A	cfs
Interception with Clogging	Q_{ma} =	N/A	N/A	cfs
Resulting Grate Capacity (assumes clogged condition)	**Q_{Grate} =**	**N/A**	**N/A**	**cfs**
Curb Opening Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	1.33	1.33	
Clogging Factor for Multiple Units	Clog =	0.03	0.03	
Curb Capacity as a Weir (based on MHFD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	9.0	9.0	cfs
Interception with Clogging	Q_{wa} =	8.7	8.7	cfs
Curb Capacity as an Orifice (based on MHFD - CSU 2010 Study)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	37.7	37.7	cfs
Interception with Clogging	Q_{oa} =	36.5	36.5	cfs
Curb Opening Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	17.1	17.1	cfs
Interception with Clogging	Q_{ma} =	16.6	16.6	cfs
Resulting Curb Opening Capacity (assumes clogged condition)	**Q_{Curb} =**	**8.7**	**8.7**	**cfs**
Resultant Street Conditions		MINOR	MAJOR	
Total Inlet Length	L =	20.00	20.00	feet
Resultant Street Flow Spread (based on street geometry from above)	T =	17.0	17.0	ft
Resultant Flow Depth at Street Crown	d_{CROWN} =	0.0	0.0	inches
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.30	0.30	ft
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.76	0.76	
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**8.7**	**8.7**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)	$Q_{PEAK\ REQUIRED}$ =	1.3	7.2	cfs

AREA INLET IN A SWALE

Anythink Nature Library - Infrastructure Phase
SD-INLET-A02.2



This worksheet uses the NRCS vegetal retardance method to determine Manning's n.

For more information see Section 7.2.3 of the USDCM.

Analysis of Trapezoidal Grass-Lined Channel Using SCS Method

NRCS Vegetal Retardance (A, B, C, D, or E)	A, B, C, D, or E =	D	
Manning's n (Leave cell D16 blank to manually enter an n value)	n =	see details below	
Channel Invert Slope	S_O =	0.0115	ft/ft
Bottom Width	B =	0.00	ft
Left Side Slope	Z1 =	3.00	ft/ft
Right Side Sloe	Z2 =	3.00	ft/ft

Check one of the following soil types:

Soil Type:	Max. Velocity (V_{MAX})	Max Froude No. (F_{MAX})
Non-Cohesive	5.0 fps	0.60
Cohesive	7.0 fps	0.80
Paved	N/A	N/A

Choose One:
- (●) Non-Cohesive
- ( ) Cohesive
- ( ) Paved

		Minor Storm	Major Storm	
Maximum Allowable Top Width of Channel for Minor & Major Storm	**T_{MAX} =**	**9.00**	**9.00**	**ft**
Maximum Allowable Water Depth in Channel for Minor & Major Storm	**d_{MAX} =**	**1.50**	**1.50**	**ft**

Maximum Channel Capacity Based On Allowable Top Width

		Minor Storm	Major Storm	
Maximum Allowable Top Width	**T_{MAX} =**	**9.00**	**9.00**	**ft**
Water Depth	d =	1.50	1.50	ft
Flow Area	A =	6.75	6.75	sq ft
Wetted Perimeter	P =	9.49	9.49	ft
Hydraulic Radius	R =	0.71	0.71	ft
Manning's n based on NRCS Vegetal Retardance	n =	0.045	0.045	
Flow Velocity	V =	2.84	2.84	fps
Velocity-Depth Product	VR =	2.02	2.02	ft^2/s
Hydraulic Depth	D =	0.75	0.75	ft
Froude Number	Fr =	0.58	0.58	
Maximum Flow Based on Allowable Water Depth	**Q_T =**	**19.2**	**19.2**	**cfs**

Maximum Channel Capacity Based On Allowable Water Depth

		Minor Storm	Major Storm	
Maximum Allowable Water Depth	**d_{MAX} =**	**1.50**	**1.50**	**ft**
Top Width	T =	9.00	9.00	ft
Flow Area	A =	6.75	6.75	sq ft
Wetted Perimeter	P =	9.49	9.49	ft
Hydraulic Radius	R =	0.71	0.71	ft
Manning's n based on NRCS Vegetal Retardance	n =	0.045	0.045	
Flow Velocity	V =	2.84	2.84	fps
Velocity-Depth Product	VR =	2.02	2.02	ft^2/s
Hydraulic Depth	D =	0.75	0.75	ft
Froude Number	Fr =	0.58	0.58	
Maximum Flow Based On Allowable Water Depth	**Q_d =**	**19.2**	**19.2**	**cfs**

Allowable Channel Capacity Based On Channel Geometry

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**19.2**	**19.2**	**cfs**
MAJOR STORM Allowable Capacity is based on Depth Criterion	**d_{allow} =**	**1.50**	**1.50**	**ft**

Water Depth in Channel Based On Design Peak Flow

Design Peak Flow	**Q_o =**	**1.0**	**18.1**	**cfs**
Water Depth	**d =**	**0.73**	**1.48**	**ft**
Top Width	T =	4.38	8.87	ft
Flow Area	A =	1.60	6.55	sq ft
Wetted Perimeter	P =	4.61	9.35	ft
Hydraulic Radius	R =	0.35	0.70	ft
Manning's n based on NRCS Vegetal Retardance	n =	0.126	0.046	
Flow Velocity	V =	0.63	2.76	fps
Velocity-Depth Product	VR =	0.22	1.94	ft^2/s
Hydraulic Depth	D =	0.36	0.74	ft
Warning 04 Froude Number	Fr =	0.18	0.57	

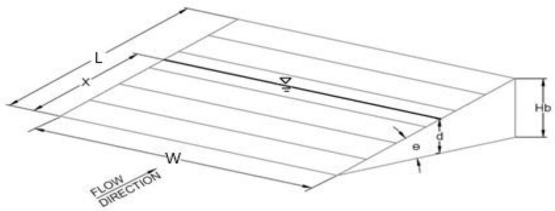
Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'
Major storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

AREA INLET IN A SWALE

Anythink Nature Library - Infrastructure Phase
SD-INLET-A02.2

Inlet Design Information (Input)

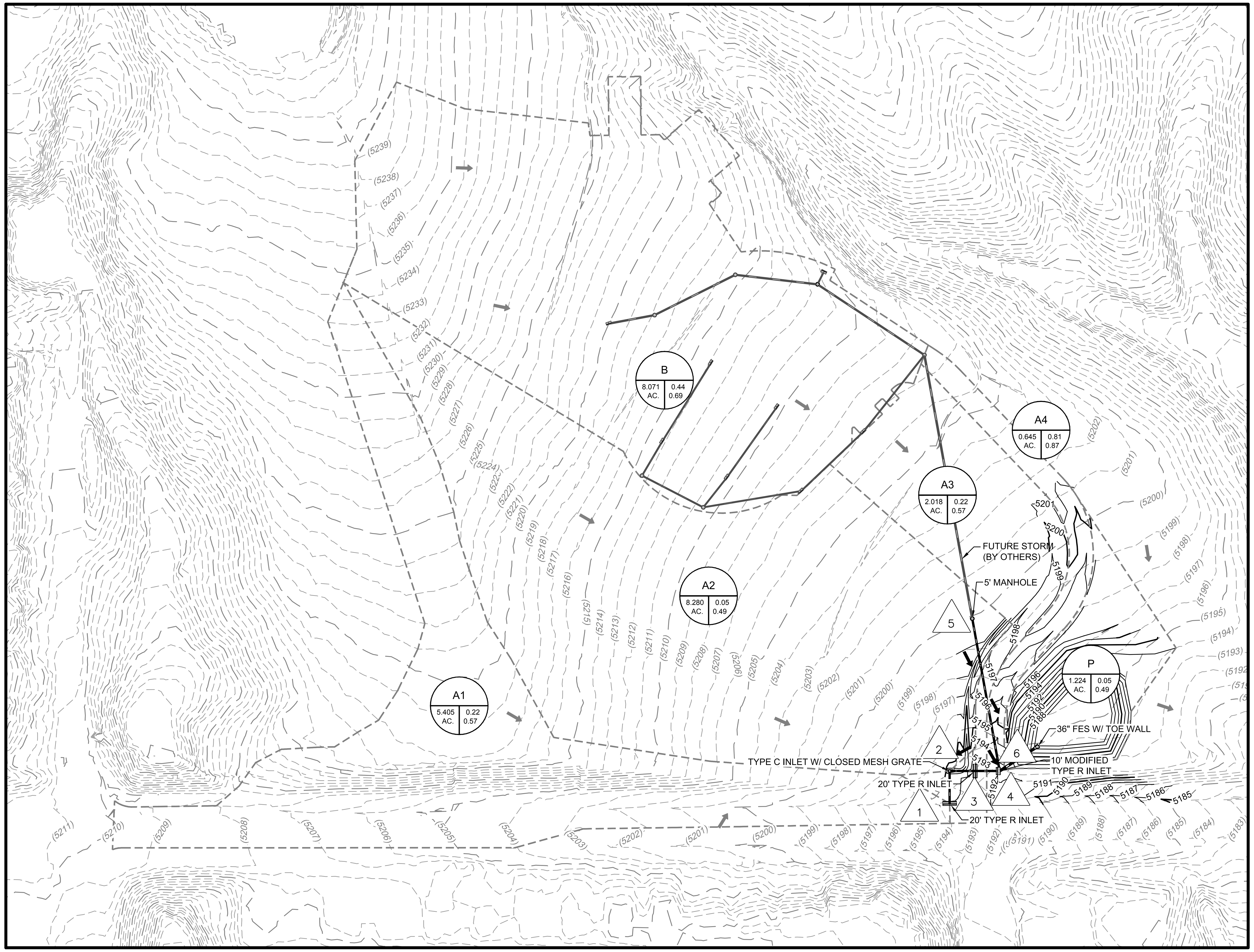
Type of Inlet	CDOT Type C (Depressed)	Inlet Type =	CDOT Type C (Depressed)	
Angle of Inclined Grate (must be <= 30 degrees)		θ =	0.00	degrees
Width of Grate		W =	3.00	ft
Length of Grate		L =	3.00	ft
Open Area Ratio		A_{RATIO} =	0.70	
Height of Inclined Grate		H_B =	0.00	ft
Clogging Factor		C_f =	0.50	
Grate Discharge Coefficient		C_d =	0.84	
Orifice Coefficient		C_o =	0.56	
Weir Coefficient		C_w =	1.81	



		MINOR	MAJOR	
Water Depth at Inlet (for depressed inlets, 1 foot is added for depression)	d =	1.73	2.48	
Grate Capacity as a Weir				
Submerged Side Weir Length	X =	3.00	3.00	ft
Inclined Side Weir Flow	Q_{ws} =	21.6	37.0	cfs
Base Weir Flow	Q_{wb} =	30.8	52.8	cfs
Interception Without Cloggging	Q_{wi} =	73.9	126.8	cfs
Interception With Clogging	Q_{wa} =	37.0	63.4	cfs
Grate Capacity as an Orifice				
Interception Without Clogging	Q_{oi} =	37.4	44.8	cfs
Interception With Clogging	Q_{oa} =	18.7	22.4	cfs
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**18.7**	**22.4**	**cfs**
Bypassed Flow	**Q_b =**	**0.0**	**0.0**	**cfs**
Capture Percentage = Qa/Qo	**C% =**	**100**	**100**	**%**

Warning 04: Froude No. exceeds USDCM Volume I recommendation.

CAUTION: IF THIS SHEET IS NOT 22"x34" IT IS A REDUCED PRINT



LEGEND:

- PROPERTY LINE
- RIGHT-OF-WAY LINE
- 5820 PROPOSED 5' CONTOUR
- 5821 PROPOSED 1' CONTOUR
- 5820 EXISTING 5' CONTOUR
- 5821 EXISTING 1' CONTOUR
- PROPOSED STORM LINE
- EXISTING STORM LINE
- FUTURE STORM LINE
- PROPOSED STORM INLET
- EXISTING STORM INLET
- BASIN BOUNDARY
- EMERGENCY OVERFLOW PATH
- X DESIGN POINT
- FLOW DIRECTION
- EXISTING FLOW DIRECTION

BASIN DESIGNATION — X; AREA — X.XX AC.; 5 YR "C" VALUE — X.XX; 100 YR "C" VALUE — X.XX

RUNOFF SUMMARY						
BASIN LABEL	DESIGN POINT	AREA	LOCAL (CFS)		ACCUMULATIVE (CFS)	
			Q5	Q100	Q5	Q100
A1	1	5.40	2.95	13.76		
A2	2	8.28	1.0	18.4	3.9	31.4
A3	3	2.02	1.3	6.2	5.0	36.5
A4	4	0.65	2.4	5.0		
B	5	8.07	9.7	29.4		
					14.1	62.9

WM

0 50 100 200

SCALE: 1" = 100'

WARE MALCOMB assumes no responsibility for utility locations. The utilities shown on this drawing have been plotted from the best available information. It is, however, the contractors responsibility to field verify the location of all utilities prior to the commencement of any construction.

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FOR AND ON BEHALF OF WARE MALCOMB

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INFRASTRUCTURE PHASE

CONSTRUCTION DOCUMENTS

DRAINAGE MAP

NO.	DATE	REMARKS
1	10/07/2022	60% CD SUBMITTAL
2	11/18/2022	90% CD SUBMITTAL
3	04/18/2023	100% CD SUBMITTAL

JOB NO.:	DCS22-4022
PA / PM:	J. MANN
DRAWN BY:	I. CRAWFORD
DATE:	5/19/2023

SHEET

DR1